

1. A method for operating a disk array storage device that processes transactions with multiple tasks of different categories performed in multiple logical storage devices, said method comprising the steps of:

- 5       A) processing the tasks according to their respective positions of corresponding task requests in a task queue,
- B) assigning priority to one of the logical storage devices,
- 10       C) upon receiving a task request from any of the logical storage devices:
  - i) determining the task category and the logical storage device related to the task,
  - 15       ii) transferring a task request of a first category to a position in the task queue having a first priority,
  - iii) transferring a task request of a second category related to the one storage device to a position

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in the task queue having a second priority that is less than the first priority, and

- iv) transferring any other task request to a position in the task queue of a third priority that is less than the second priority.

- 2. A method as recited 1 wherein said transfer of a task request of the first category produces a transfer to the position in the task queue having the highest priority if the task is related to the one storage device.
- 3. A method as recited in claim 2 wherein transfers of task requests of the second category are dependent upon an independent operating condition and said method comprises the additional step of establishing the independent operating condition.

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4. A method as recited in claim 3 wherein a start command task request is generated when a logical storage device completes processing a command and another command is in its command queue, said category determination assigning the start command task request to the second category.

5. A method as recited in claim 3 wherein the disk array storage device includes a memory and wherein each logical storage device is allocated certain space in the memory whereby a write space task requested is generated each time a logical storage device attempts to use space in excess of the allocated space, said category determination assigning a write space task request to the second category.

6. A method as recited in claim 3 wherein the disk array storage device includes a memory and each logical storage device is allocated certain space in the memory whereby a

5 write space task request is generated each time a logical  
storage device attempts to use space in excess of the  
allocated space and wherein said data storage facility  
includes means for controlling the priority given to a  
write space task, said category determination assigning a  
write space task request to the second category and  
10 wherein said second category task transfer of a write  
space task request related to the one logical storage  
device to a second priority position in the task queue  
depends upon the priority controlling means.

7. A method for operating a disk array storage device that  
processes transactions with multiple tasks of first and  
second categories performed in multiple logical storage  
devices, said method comprising the steps of:

- 5 A) processing the tasks according to the positions of  
corresponding task requests in a task queue,  
B) assigning priority to one of the logical storage

devices,

10           c) upon receiving a task request from any of the logical  
storage devices:

- 15           i) determining the task category and the logical  
storage device related to the task,
- ii) transferring a task request of the first  
category related to the other storage devices to  
a position in the task queue of a first  
priority,
- iii) transferring a task request of a first category  
related to the one storage device to a position  
in the task queue having the highest priority,  
and
- 20           iv) transferring any other task request to a  
position in the task queue with a priority that  
is less than the first priority.

8. A method as recited in claim 7 wherein the other tasks include tasks in second and third categories and wherein task requests for second category tasks are transferred to a position of a second priority in the task queue that is less than the first priority in response to a control function and task requests in the third category are transferred to a position in the task queue that has a priority that is less than the first and second priorities.

9. A method as recited in claim 8 wherein the disk array storage device has means for enabling and disabling a priority change, said transfer of a first category task request related to the one logical storage device being permitted when priority changes are enabled.

10. A method as recited in claim 8 wherein the completion of the processing of one command enables the generation of a

start command task when another command is in a command  
queue, said category determination assigning a start  
command task request to the second category.

5 11. A method as recited in claim 8 wherein the disk array  
storage device includes a memory and wherein each logical  
storage device is allocated certain space in the memory  
whereby a write space task is generated each time a  
logical storage device attempts to use space in excess of  
5 its allocated space, said category determination assigning  
a write space task as a task of the second category.

12. A method as recited in claim 11 wherein the disk array  
storage device includes means for controlling the priority  
given to a write space task, said category determination  
assigning a write space task as a task of the second  
category and said second category task transfer of a write  
5 space task request related to the one logical storage

device to a second priority position in the task queue when the priority controlling means enables priority to be given.

13. A method for improving the performance of an e-mail application program operating in a data processing system with a host processor and a disk array storage device that includes a plurality of logical storage devices and that operates in response to tasks including reconnect tasks requested when a logical storage device completes a task, a second category of tasks requested in response to certain activities within the disk array storage device and a third category of other tasks and wherein each e-mail transaction requires a log entry in a dedicated logical storage device as a condition precedent to the processing of any transaction, said method comprising the steps of:



- 15           A)   maintaining a task queue for different task requests  
            that schedule the order by which tasks are completed  
            within the disk array storage device,
- B)   upon receiving a task request related to any of the  
                 logical storage devices:
- 20           i)   determining the task category and the logical  
             storage device related to the task,
- ii)  transferring a reconnect task related to a  
                 logical storage device other than the dedicated  
                 logical storage device to a position in the task  
                 queue of a first priority,
- 25           iii) transferring a reconnect task request related to  
             the dedicated logical storage device to that  
             position in the task queue having the highest  
             priority,
- 30           iv)  transferring a task request of the second  
             category related to the dedicated logical  
             storage device to a position in the task queue

with a second priority that is less than the first priority, and

- v) transferring any other task request from the logical storage devices to a position in the task queue with a priority that is less than the first priority and second priorities.

14. A method as recited in claim 13 wherein one of the second category of tasks is a start command task that is requested when a logical storage device completes processing a command and another command is in its command queue, said second task category transferring step including:

- i) transferring a start command task request related to the dedicated logical storage device to a highest priority position in the second priorities, and
- ii) transferring start command task requests related

to any other storage device to the end of the task queue at the least priority.

15. A method as recited in claim 13 wherein one of the second category of tasks is a write space task that is generated when storage in a cache memory for a given logical storage device exceeds a predetermined level, said second task category transferring step including:

- i) transferring a write space task related to the dedicated logical storage device to a highest priority position in the second priorities, and
- ii) transferring write space tasks related to the other logical storage devices to the end of the task queue at the least priority.

16. A method as recited in claim 15 wherein the second category of tasks additionally includes a start command task that is requested when a logical storage device

5 completes processing a command and another command is in  
its command queue, said second task category transferring  
step including:

- i) transferring a start command task related to the  
dedicated logical storage device to a highest  
priority position in the second priorities, and
- 10 ii) transferring start command tasks related to  
other logical storage devices to the end of the  
task queue at the least priority.

17. A method as recited in claim 13 additionally comprising  
the step of establishing a second category transfer  
condition, said second category task transfer to the  
highest priority position in the second priorities  
occurring only when the condition exists, said second  
5 category task transfer otherwise being to the end of the  
task queue.

18. A method as recited in claim 17 wherein the second category transfer condition is a percentage of operations and said second category transfer includes the step of tracking the number of second category transfers from the dedicated logical storage device.

19. A method as recited in claim 18 wherein the second category of tasks includes a start command task that is requested when a logical storage device completes processing a command and another command is in its command queue and a write space task that is generated when storage in a cache memory for a given storage device exceeds a predetermined level, said second category number tracking including tracking both start command tasks and write space tasks related to the dedicated logical storage device for determining whether the condition is met.

20. A method as recited in claim 19 additionally comprising the step of establishing one of two operating states for processing write space tasks, said second category transfer step transferring write space tasks related to the dedicated logical storage device to the end of the task queue during one of the states, said second category number tracking including tracking both start command tasks and those write space tasks that occur during the other of the operating states.

21. A method for improving the performance of an e-mail application program operating in a data processing system with a host processor and a disk array storage device that comprises a plurality of logical storage devices and that operates in response to tasks including reconnect tasks generated when a logical storage device completes a task, a second category of tasks generated in response to certain activities within the disk array storage device

10 and a third category of other tasks and wherein each e-mail transaction requires a log entry in a dedicated logical storage device as a condition precedent to the processing of any transaction, said method comprising the steps of:

- 15 A) maintaining a first-in, first-out task queue for different tasks that schedule the order by which tasks are completed within the disk array storage device,
- B) normally adding reconnect tasks to the beginning of the queue and other tasks to the end of the task queue except for:
- 20 i) transferring reconnect tasks related to the dedicated logical storage device to the head of the task queue whereby reconnect tasks related to other logical storage devices are transferred to a location following any reconnect task
- 25 related to the dedicated logical storage device,

and

- ii) transferring a task request of the second category related to the dedicated logical storage device to a position in the task queue that follows any reconnect task requests in the task queue.

22. A method as recited in claim 21 wherein the second category of tasks includes a start command task that is requested when a logical storage device completes processing a command and another command is in its command queue and a write space task that is generated when storage in a cache memory for a given storage device exceeds a predetermined level and wherein the disk array storage device includes enabling means for enabling a priority change for write space tasks related to the dedicated logical storage device and tracking means for tracking the occurrence of second category tasks related



to the dedicated logical storage device, said second category task transfer step comprising:

- i) transferring a write space task request related to the dedicated logical storage device to the end of the queue when the enabling means disables the write space task priority change, and
- ii) transferring, in response to the tracking means, a write space task request related to the dedicated logical storage device that exists when the enabling means enables the write space task priority change and a start command task request related to the dedicated logical storage device to a position following any reconnect task requests in the task queue and otherwise transferring the second category task requests to the end of the queue.